IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Schoo, et al.	EXAMINER: HO, Anthony
SERIAL NO.:	10/561,261	ART UNIT: 2815
FILED:	February 10, 2006	CONFIRMATION NO.: 5706
TITLE:	Light Emitting Diode	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 35 USC § 1.132

Dear Sir:

In regard to the referenced application, I, Hermannus Franciscus Maria Schoo, the undersigned, hereby declare that I am an inventor of the above-captioned invention. My credentials as an expert in the field of the present application are detailed on Exhibit "A" attached hereto. I further declare that:

1. In preparing to sign this Declaration, I have read the above-captioned application and reviewed its claims in the amended form presented in the Amendment and Response submitted with this Declaration. I understand that the claims of the application are being rejected as obvious over Yu et al. (U.S. Patent Application Publication No. 2002/0017612), Burroughes (GB 2340304), Capasso et al. (U.S. Patent No. 6,278,134) and Hatwar (EP 1286569). I have read each of these references. This Declaration is offered in rebuttal of the pending obviousness rejection.

2. Claims 22-34 and 47 are rejected in view of Yu et al. The examiner states that Yu et al also discloses a detector in optical communication with a LED. The examiner bases this on Figure 1 of the Yu et al. reference.

3. In my opinion, the examiner is mistaken. Yu et al. relates only to a photodetector. No LED is shown on Figure 1. A photodetector is not an LED. The photodetector of Yu et al. is capable of producing a current <u>in response to light</u> impinging thereupon. Thus, this is opposite to an LED (which generates photons when a suitable current is applied).

4. Figure 1, relied upon by the examiner, may be further understood with reference to paragraphs [0066] and [0067]. These paragraphs unambiguously show that light 18 is not generated by the active layer 12. The arrows (showing light) clearly point in the direction of the active layer, not away from it. Thus this further illustrates that external light is beamed into the active layer, where it may be detected, and is certainly not generated by the active layer.

5. Thus, in Yu et al. only a light-receiving part is disclosed that comprises an organic active layer. Such active layer is not inherently capable of generating light.

6. In paragraph [0067] of the Yu et al. reference, it is also explicitly stated that the detector is wired "to measure the photoresponse generated in the photodiode in response to light 18." There is no reference whatsoever that the light is generated by a LED comprising an organic electroactive compound.

7. Yu et al. clearly relates to image sensors (see *e.g.* the abstract, paragraph [0004]) so it is apparent to one skilled in the art that the detector of Yu et al. will not include an LED to generate light 18. If the Yu et al. device generated light, it is my opinion that the detector would not be functional, because the light generated from such device would prevent the detector from capturing images.

8. The examiner further states that a detector inherently comprises a signal channel and a separate reference channel because these parts would be essential to the intended use. In my opinion, this is not true. Image sensors do not require a reference channel in order to function.

9. At page 6 of the office action, the examiner states that the recitation "wherein the first compound has a maximum in the emission spectrum at a different wavelength than the second compound" is an inherent property since Yu et al. discloses using the same materials as in the present application. However, as indicated above, Yu et al. does not disclose an organic LED at all.

10. Moreover, Yu et al. does not disclose specifically choosing a combination of compounds each capable of emitting light such that light is generated with a spectrum having two emission maxima.

11. The examiner objects to claims 29-33 by alleging that Figures 15A-15C of Yu et al. shows the emission of at least two intensity maxima and their differences between them. However, as detailed below, these figures do not show emission spectra.

12. With reference to Example 17 at page 13 of Yu et al., I observe the following: Figure 15A shows a spectral response of a photodiode, *i.e.* it shows how the photodiode responds when it is <u>exposed</u> to light. This is not an emission spectrum, but the opposite: an absorption spectrum. From the absorption spectrum one cannot establish whether the photodiode has any light-emitting properties, let alone what such properties would be.

13. Likewise, Figure 15B also shows spectral responses to light, not an emission spectrum, of different pixels each sensitive to a different color of light.

14. Figure 15C shows transmittance spectra of three different pixels, *i.e.* it shows how transparent a pixel is to light of a specific wavelength. This has nothing to do with emission spectra.

15. Claims 22-24 and 47 are rejected as obvious over Burroughes in view of Capasso et al. Burroughes is directed to organic LEDs but does not relate to their use in detection systems at all. Burroughes concerns LEDs that emit light of a specific color, and in particular LEDs that emit pure white light (see page 1, paragraph 2).

16. In order to accomplish the emission of specific colors of light it is usually desired to provide an LED with a single emission intensity maximum, namely at the wavelength of the desired color. In the case of a white LED, it is desirable to have a very broad emission spectrum with a single intensity maximum, where the emission spectrum covers wavelengths in substantially the entire visible wavelength range. This emission spectrum would result in the best "color-rendering performance" as a white light source.

17. Thus, although Burroughes may show a LED displaying an emission spectrum with more than one intensity maximum, there is no suggestion whatsoever that such an LED specifically would be suitable for use in a detection system as defined in the present claims. The only reference to an application in Burroughes seems to be the use of the disclosed LED in display devices (page 1, 4th paragraph).

18. Thus, in my opinion, there is no rationale for the skilled person to consider the use of a LED incidentally having more than one intensity maximum in its emission spectrum in a detection system, nor would a skilled person have reason to consider that this would offer advantages such as improved robustness.

19. Hatwar is directed to a white organic LED; for the reasons mentioned above, in my opinion, there is absolutely no rationale provided to a skilled person to consider the use of a LED incidentally having more than one intensity maximum in its emission spectrum in a detection system. Furthermore, there is no reason for one skilled in the art to consider that this would offer advantages such as improved robustness.

20. The examiner asserts that Capasso et al. discloses a detector in optical communication with a LED and refers to Figure 7 (see page 8, lines 1 and 2) to support this position. In my opinion, the examiner is mistaken. Figure 7 does not disclose a LED. Figure 7 merely refers to "an optical source." From the specification it is clear that a specific optical source is meant, namely a dual wavelength quantum cascade (QC) optical source, in particular a dual wavelength QC laser (see column 9, lines 19-35, claim 1, column 1, lines 18-19). LEDs are generally not quantum cascade optical devices.

21. Furthermore, it is important to note that the detection system of Capasso et al. does not comprise a light source that can simultaneously emit light with at least two intensity maxima in the emission spectrum.

22. From claim 1 of Capasso et al. it is clear that one wavelength is emitted upon application of a first polarity voltage and a second wavelength is emitted upon application of a second polarity voltage. Thus, it is clear that the wavelengths would be emitted in an alternating manner. This also follows unambiguously from column 2, lines 43-64.

23. Starting from column 2, line 43, it is stated that

> *"The present invention discloses a unipolar cascade light source that exhibits different characteristics as a function of the polarity of the applied voltage (the "different characteristics may comprise, for example, an emission wavelength which is dependent upon the polarity of the applied bias voltage, a polarity-dependent output power or operating voltage, etc.). In particular, a unipolar light source structure is formed that is capable of generating a first emission wavelength (λ+) under a positive bias supply voltage and a second emission wavelength (λ-) under a negative bias supply voltage."*

24. Since the applied polarity cannot be positive and negative at the same time, it is evident that the light source of Capasso et al. cannot emit two wavelengths at the

same time. This is also explained starting from column 2, line 61 of Capasso et al.:

"Advantageously, these wavelengths may be made as close as desired, since <u>they are generated at different times</u> and by opposing bias voltages."

25. The examiner further alleges that it is inherent that a detector comprises a signal channel and a separate reference channel and considers this to be essential features of the detector. In my opinion, this is speculative and incorrect. Please note that Figure 7 only shows one detector unit for both wavelengths, without any reference to separate channels for a detection signal and a reference signal.

26. Moreover, if one would assume that the skilled person would be motivated from Capasso et al. to use one of the wavelengths as a reference signal and the other as a detection signal, there is still no suggestion to use different detectors for different signals. To the contrary, if anything, the skilled person would conclude that only one channel is used for both wavelengths, in particular since the emission of both wavelengths would be sequentially and thus there would be no rationale to use separate channels.

27. At page 8 of the office action the examiner concludes that it would be obvious to modify the LED as taught by Burroughes with a detector as taught by Capasso et al. The light source of Capasso et al. and the LED of Burroughes or Hatwar are not interchangeable. Capasso et al. relates to a light source that emits different wavelengths sequentially, not simultaneously, depending on the polarity of the bias supply voltage. It is apparent that the LED of Burroughes or Hatwar would not properly function in a detection system of Capasso et al., the latter requiring the light source to emit different wavelengths under a positive and negative bias supply voltage respectively.

28. It is typical that a diode such as a LED according to Burroughes or Hatwar only works in forward bias. In reverse bias no current can pass, and no light will be

emitted. Thus, the Burroughes or Hatwar LED would be inoperative in the Capasso et al. configuration. Accordingly, the skilled person would have no reason or rationale to combine Capasso et al. with Burroughes or Hatwar.

29. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Date: 28-1-2009

Hermannus Franciscus Maria Schoo

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EXHIBIT A

CURRICULUM VITAE OF DR. HERMAN F.M. SCHOO

Biographic details of Dr. Herman F.M. Schoo

1992-1999: From February 1992 involved as a polymer chemist in several multidisciplinary projects at the Philips Research Laboratories.
These included the development of polycarbonates that do not show stress-induced birefringence, the synthesis of (block) copolymers that can be used in the steric stabilization of water-based colloidal suspensions of (for instance) metal oxides, and the development of (semi-)conducting polymers. Developed PPV materials that were later commercialized by Covion (now Merck). Was involved in setup of PolyLED Business Unit at Philips, resulting in a pilot production unit in Heerlen, being the first commercial producer of polymer light emitting diodes.

1999-2005: From February 1999 at TNO Industrial Technology and as research fellow of the Dutch Polymer Institute to set up a group, working on semi-conducting polymers and devices. This encompassed Organic LEDs, Transistors, Solar Cells and Sensors based on organic devices, involving around 20 researchers. Involved as Chief Technology Officer in a startup-company, "Orgatronics", aiming at pre-production support and pilot production of organic electronic device applications. Member of the Scientific Advisory Board of the Plastic Electronics Conference. Lecturer in a number of Top Technology Courses on polymer Electronics. Co-organizer of the International Conference on Organic Electronics. Involved in setup of the Holst Centre at the Eindhoven High Tech Campus. Currently, this is one of the leading institutes in the field of Organic and Large Area Device Technology

CURRENT POSITION Program manager in the Holst Centre of the strategic program "Sensor Tags & Systems" where combinations of organic, large area electronic device technology is investigated
Recently appointed as Senior Research Fellow of TNO

AREAS OF EXPERTISE
- Synthesis of high quality (semi-)conducting materials for polymer/organic devices;
- Physics and mathematical modeling of new devices based on the relationship between molecular structure and material properties;
- Semiconducting polymers, to produce plastic electronic components, such as field effect transistors, organic solar cells, and polymer light emitting diodes;
- Applications of organic semi-conducting devices
- Process technology involved in manufacture of organic electronics

PUBLICATIONS
> 90 publications, mainly on chemistry, physics, lifetime and application of organic semiconductor
> 60 invited lectures
> 30 patents/patent applications